

4-15

**US EPA  
Source Test Report**

**XTO Energy, Inc.  
Little Canyon Facility,  
Utah**

**March 4, 2015**

**Permit: N/A**

**Engine: Caterpillar G3516LE**

**SN: 4EK03003**

**Unit ID: LCU #4**

Prepared By:

Oasis Emission Consultants, Inc.  
2730 Commercial Way  
Rock Springs, WY 82901





April 1, 2015

Mr. Craig Allison  
XTO Energy, Inc.  
810 Houston Street  
Fort Worth, TX 76102

Dear Mr. Allison:

**Re: Engine Emission Testing For XTO Energy, Inc., Little Canyon Facility Unit LCU #4.**

Oasis Emission Consultants, Inc. was requested to perform an engine emission test on a Caterpillar G3516LE lean burn engine located on tribal land in Utah.

**Emission Levels**

The average recorded levels are shown in the attached report, and summarized below.

Emission Unit	Avg NOx	Avg CO
g/BHP-hr	0.18	0.05
lbs/hr	0.29	0.09

**Formaldehyde Levels**

Test Run	HCOH (ppm)	HCOH @ 15% O2 (ppm)	HCOH @ 15 % O2 Limit
1	9.72	5.17	14
2	9.96	5.30	14
3	10.00	5.37	14
<b>AVG</b>	<b>9.90</b>	<b>5.28</b>	<b>14</b>

**Catalyst Parameters**

Test Run	Inlet Temp (°F)	DP (in H <sub>2</sub> O)
1	804	3.2
2	806	3.2
3	807	3.2
<b>AVG</b>	<b>806</b>	<b>3.2</b>

### Engine Load

Test Run	BHP
1	1263.0
2	1263.7
3	1292.0

### Testing Protocol

The attached report was generated using an extractive FTIR system using methodologies as required by EPA 40 CFR 60 Methods 1, 19, ASTM D6522-00(2005) and ASTM D6348 – 03 and/or EPA 40 CFR 63(A) Method 320.

### Quality Assurance

Oasis has performed a full cursory review of the raw data and calculated results in this report. Any errors we have encountered have been listed in the body of this report. After performing the review, we are confident that this engine has met all requirements.

If you have any questions or require further information, please contact the undersigned at (307) 382-3297.

Yours truly,  
Oasis Emission Consultants, Inc.



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Charles A. Chapman  
Senior Environmental Scientist



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Christopher N. Knott, P.Eng.  
Director, Engineering & Operations

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## **SOURCE EMISSION TEST REPORT**

**PERMIT N/A**

**Test Performed By:** **Oasis Emission Consultants, Inc.**

**Facility Name:** **Little Canyon Facility  
Unit LCU #4**

**Emission Source:** **Caterpillar G3516LE**

**Date of Test:** **March 4, 2015**

**Date of Report:** **April 1, 2015**

## **1.1 Introduction**

The purpose of this source test was to demonstrate that source emissions from a Caterpillar G3516LE engine do not exceed maximum allowable levels specified by guidelines issued in EPA 40 CFR 63, Subpart ZZZZ.

The Caterpillar G3516LE engine is a lean burn engine that employs an Oxidation Catalytic Convertor to regulate emission levels.

Three test runs were performed on March 4, 2015 to analyze NOx, CO & HCOH emission levels according to methodologies outlined in the ASTM D 6348-03 & EPA 40 CFR 63(A), Method 320 Protocol. Effluent exhaust was sampled from the engine through an extractive heated stainless steel sample line interconnected to an MKS 2030 FTIR analyzer.

Each of the three runs consisted of sixty (60) readings taken at one (1) minute intervals.

Test runs were observed by the following individuals:

- Stephen Pyer, Oasis Emission Consultants, Inc.
- Derrick, XTO Energy, Inc.

## **2.1 Equipment Utilization**

The following equipment was used during the tests performed at this facility in conjunction with procedures outlined by ASTM D 6348-03 & EPA 40 CFR 63(A), Method 320.

- (1) MKS MultiGas 2030 FTIR Continuous Gas Analyzer
- (1) Laptop Computer For The FTIR Analyzer Using MKS MG2000 Software
- (1) 30ft or 100ft Heated Teflon Line w/ Heated Sample Probe & Spike Bypass Line
- (1) Portable O<sub>2</sub>/CO<sub>2</sub> Analyzer
- (6) EPA Protocol G1 Calibration Gas (CO, NO<sub>x</sub>, C<sub>2</sub>H<sub>4</sub>, CH<sub>3</sub>CHO, C<sub>3</sub>H<sub>8</sub> & NO<sub>2</sub>)

The MKS Multigas 2030 FTIR Analyzer was used to measure NO<sub>x</sub> & CO on a dry basis. Formaldehyde levels were measured on a wet basis and were corrected to produce levels on a dry basis. A pre Direct and System calibration measurement was made on compounds of NO<sub>x</sub>, CO, CH<sub>3</sub>CHO, C<sub>3</sub>H<sub>8</sub> & C<sub>2</sub>H<sub>4</sub>. In addition, a post Direct calibration was made on compounds of NO<sub>x</sub>, CO, CH<sub>3</sub>CHO & C<sub>3</sub>H<sub>8</sub>. A post System calibration was also conducted for C<sub>2</sub>H<sub>4</sub>. Compounds of CO<sub>2</sub>, CO, NO, CH<sub>3</sub>CHO & C<sub>3</sub>H<sub>8</sub> were measured for the quality assurance spiking requirements of ASTM D 6348-03 & EPA 40 CFR 63(A), Method 320

When a gas sample is introduced in the gas cell, the infrared beam is partially absorbed by the gas species present. The spectral frequencies absorbed and their intensity are due to the atoms associated with the chemical bond and the strength of that bond. The absorption spectrum is unique for each infrared-active gas. The MKS Analyzer measures the absorption spectrum, and its analysis algorithm measures the concentration of each gas using pre-loaded calibrations. The MG2000 software allows for the continuous measurement, display and recording of the sample stream.

The MKS Multigas 2030 FTIR Analyzer operated with a spectral resolution of 0.5 cm<sup>-1</sup> and a scan time of 30 seconds. The FTIR spectrometer utilizes a multi-pass gas cell with a 5.11 meter effective pathlength.

### **3.1 Discussion Of NOx, CO & HCOH Test Results**

Please refer to Appendix A for the raw NOx, CO & HCOH test results. Please refer to Appendix B for a listing of all raw data, calibration error response and calculations performed per ASTM & EPA requirements. Overall the average emission levels complied with Consent Decree guidelines on a g/BHP-hr basis. Testing for NOx, CO & HCOH were run concurrently with one another.

#### **3.1.1 Source Test 1: Caterpillar G3516LE, NOx, CO & HCOH**

The first test was performed from 9:19 to 10:22 for NOx, CO & HCOH.

The average NOx and CO levels were found to be **0.19 g/BHP-hr and 0.05 g/BHP-hr** respectively. The Formaldehyde level was found to be **5.17 ppm @ 15% O<sub>2</sub>**, which tested in compliance with the current EPA standards.

Test Run	NOx (ppm)	NOx (g/BHP-hr)	CO (ppm)	CO (g/BHP-hr)	HCOH (ppm)	HCOH @ 15% O <sub>2</sub> (ppm)
1	22.66	0.19	10.28	0.05	9.72	5.17

#### **3.1.2 Source Test 2: Caterpillar G3516LE, NOx, CO & HCOH**

The second test was performed from 10:31 to 11:34 for NOx, CO & HCOH.

The average NOx and CO levels were found to be **0.18 g/BHP-hr and 0.05 g/BHP-hr** respectively. The Formaldehyde level was found to be **5.30 ppm @ 15% O<sub>2</sub>**, which tested in compliance with the current EPA standards.

Test Run	NOx (ppm)	NOx (g/BHP-hr)	CO (ppm)	CO (g/BHP-hr)	HCOH (ppm)	HCOH @ 15% O <sub>2</sub> (ppm)
2	21.21	0.18	10.39	0.05	9.96	5.30

#### **3.1.3 Source Test 3: Caterpillar G3516LE, NOx, CO & HCOH**

The third test was performed from 11:38 to 12:40 for NOx, CO & HCOH.

The average NOx and CO levels were found to be **0.16 g/BHP-hr and 0.05 g/BHP-hr** respectively. The Formaldehyde level was found to be **5.37 ppm @ 15% O<sub>2</sub>**, which tested in compliance with the current EPA standards.

Test Run	NOx (ppm)	NOx (g/BHP-hr)	CO (ppm)	CO (g/BHP-hr)	HCOH (ppm)	HCOH @ 15% O <sub>2</sub> (ppm)
3	19.36	0.16	10.29	0.05	10.00	5.37

#### **4.1 Stack Sampling Location**

The sampling port for moisture, flow, NOx, CO and HCOH measurements was approximately 4 pipe diameters from the nearest upstream flow disturbance and 4 pipe diameters from the nearest downstream disturbance.

#### **4.2 Stack Sampling Methods & Procedures**

Testing followed EPA 40 CFR 63(A), Method 320 and/or ASTM D6348-03 methodologies per our standard protocol, with no exceptions.

## **5.1 Quality Assurance**

CTS procedures were followed according to ASTM requirements for both pre and post testing. Similarly, QA spiking procedures were followed. Analysis of the CO<sub>2</sub> exhaust effluent was used to determine the dilution factor. Steady levels of the CO<sub>2</sub> were observed and a sufficient duration of time was allowed to elapse for a representative average.

The calibration gas was spiked into the effluent stream using a bypass line at approximately 10% of the sampling rate. The dilution factor was obtained from observation of the stack CO<sub>2</sub> behavior using the following equation:

$$DF = \frac{CO_2\text{AVG} - CO_2\text{SPIKE}}{CO_2\text{ AVG}}$$

Where: CO<sub>2</sub>AVG = The average undiluted CO<sub>2</sub> stack gas concentration of spike measurements  
CO<sub>2</sub>SPIKE = The average diluted CO<sub>2</sub> stack gas concentration when spiked

The sample recovery was then obtained from the following equation:

$$\% \text{ REC} = \frac{(Spike \text{ MEAS} - Stack \text{ MEAS}) * (1 - DF)}{CS * DF}$$

Where: Spike MEAS = The average diluted stack gas concentration when spiked  
Stack MEAS = The average undiluted stack gas concentration  
DF = Dilution factor  
CS = Certified concentration of calibration standards

The Sample Recovery average level for CO, NO, C<sub>3</sub>H<sub>8</sub> & CH<sub>3</sub>CHO was found to be 84.1%, 80.0%, 84.3% & 89.1% respectively, which was within the allowable tolerance of Method 320 (70% to 130%). A summary of all spiking procedures/results can be found in Appendix B.

## **APPENDIX A**

XTO Energy, Inc. LCU #4						
Run 1						
Record	FTIR Measurements				Date	Time
	NOx Dry	CO ppm Dry	Formaldehyde 191C Wet	H2O% (High) 191C		
1	24.80787	10.951619	7.727871	8.62177	3/4/2015	9:19:50
2	23.448465	10.7117	7.532394	9.306349	3/4/2015	9:20:54
3	23.764498	10.564031	8.38012	11.189804	3/4/2015	9:21:57
4	23.30041	10.681586	8.020838	10.097203	3/4/2015	9:23:01
5	23.055276	10.580676	8.290955	10.557204	3/4/2015	9:24:04
6	23.196359	10.436617	9.339427	11.588738	3/4/2015	9:25:08
7	23.646577	10.372848	8.785459	11.859695	3/4/2015	9:26:11
8	23.555512	10.36147	8.269887	11.328101	3/4/2015	9:27:15
9	23.233366	10.291972	8.009114	11.908454	3/4/2015	9:28:18
10	23.750121	10.296391	8.535853	10.762577	3/4/2015	9:29:22
11	23.347911	10.337668	8.332674	11.541551	3/4/2015	9:30:25
12	23.46389	10.269462	8.22875	11.989092	3/4/2015	9:31:28
13	22.853256	10.427197	9.134502	10.530142	3/4/2015	9:32:32
14	22.878478	10.335257	8.472277	11.142207	3/4/2015	9:33:35
15	22.857208	10.548988	9.599514	10.132173	3/4/2015	9:34:39
16	22.87105	10.521417	8.580877	12.211204	3/4/2015	9:35:42
17	22.82824	10.278124	8.654255	12.536953	3/4/2015	9:36:46
18	22.651287	10.473593	8.765506	11.134012	3/4/2015	9:37:49
19	22.609186	10.342037	9.013574	12.007647	3/4/2015	9:38:53
20	21.916961	10.33813	8.327087	10.655533	3/4/2015	9:39:56
21	22.056093	10.437623	9.25425	10.987053	3/4/2015	9:40:59
22	21.74379	10.469622	8.759535	10.741208	3/4/2015	9:42:03
23	21.940573	10.254908	8.526554	10.845655	3/4/2015	9:43:06
24	22.262922	10.240289	8.64396	11.295382	3/4/2015	9:44:10
25	21.546423	10.349667	8.64223	10.570557	3/4/2015	9:45:13
26	22.60921	10.300195	8.709516	10.064105	3/4/2015	9:46:17
27	22.352675	10.067983	8.970087	11.93244	3/4/2015	9:47:20
28	22.693819	10.087023	8.603369	11.288958	3/4/2015	9:48:23
29	22.805224	10.208855	8.362228	10.903095	3/4/2015	9:49:27
30	22.501084	10.197377	8.656183	12.050976	3/4/2015	9:50:30
31	22.79665	10.21224	8.266316	10.9747	3/4/2015	9:51:34
32	22.535877	10.144146	8.4755	10.610448	3/4/2015	9:52:37
33	21.602696	10.195089	8.551492	10.764816	3/4/2015	9:53:40
34	22.377846	10.267852	8.525885	10.553512	3/4/2015	9:54:44
35	21.88829	9.985969	8.202754	10.468395	3/4/2015	9:55:47
36	21.611482	10.155475	8.725057	10.741736	3/4/2015	9:56:50
37	21.790623	10.158466	8.788744	11.660308	3/4/2015	9:57:54
38	21.947274	10.129796	8.477499	11.766507	3/4/2015	9:58:57
39	21.821796	10.182342	8.483594	10.853094	3/4/2015	10:00:01
40	22.127582	10.181358	9.285019	11.1196	3/4/2015	10:01:04
41	22.990954	10.081076	8.836274	11.036928	3/4/2015	10:02:07
42	22.737439	9.933255	9.590259	12.06029	3/4/2015	10:03:11
43	22.449508	9.994287	8.592295	11.227355	3/4/2015	10:04:14
44	22.556427	10.041094	8.464485	10.727893	3/4/2015	10:05:18
45	22.214543	10.152231	8.765093	11.069707	3/4/2015	10:06:21
46	22.710054	9.784711	8.506352	11.275555	3/4/2015	10:07:24
47	22.599704	9.981823	8.436604	10.154762	3/4/2015	10:08:28
48	23.255874	10.067568	8.700521	10.503401	3/4/2015	10:09:31
49	22.961785	10.210742	8.41594	11.341529	3/4/2015	10:10:34
50	22.794129	10.303283	8.633446	11.880165	3/4/2015	10:11:38
51	22.913396	10.175316	8.564247	10.550678	3/4/2015	10:12:41
52	22.92699	10.185859	8.550838	10.32351	3/4/2015	10:13:44
53	21.951781	10.356047	8.519721	11.192537	3/4/2015	10:14:48
54	22.006864	10.250026	8.289149	10.164823	3/4/2015	10:15:51
55	22.486888	10.165502	8.825539	10.775173	3/4/2015	10:16:54
56	22.075504	10.294001	8.842222	11.748116	3/4/2015	10:17:58
57	22.573308	10.401089	9.170568	11.69473	3/4/2015	10:19:01
58	22.839721	10.459509	9.679899	11.607173	3/4/2015	10:20:04
59	22.48823	10.296116	9.607028	12.222255	3/4/2015	10:21:08
60	22.723464	10.363826	8.849826	11.088667	3/4/2015	10:22:11
AVG	22.66	10.28	8.65	11.07		

Calculated Emission Levels					
NOx (g/BHP-hr)	NOx (lbs/hr)	CO (g/BHP-hr)	CO (lbs/hr)	HCOH Dry (ppm)	HCOH @ 15% O2 (ppm)
0.19	0.30	0.05	0.08	9.72	5.17

**XTO Energy, Inc.**

LCU #4

Run 1

Record	FTIR Measurements				Date	Time
	NOx Dry	CO ppm Dry	Formaldehyde 191C Wet	H2O% (High) 191C		
1	24.80787	10.951619	7.727871	8.62177	3/4/2015	9:19:50
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3	23.764498	10.564031	8.38012	11.189804	3/4/2015	9:21:57
4	23.30041	10.681586	8.020838	10.097203	3/4/2015	9:23:01
5	23.055276	10.580676	8.290955	10.557204	3/4/2015	9:24:04
6	23.196359	10.436617	9.339427	11.588738	3/4/2015	9:25:08
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8	23.555512	10.36147	8.269887	11.328101	3/4/2015	9:27:15
9	23.233366	10.291972	8.009114	11.908454	3/4/2015	9:28:18
10	23.750121	10.296391	8.535853	10.762577	3/4/2015	9:29:22
11	23.347911	10.337668	8.332674	11.5411551	3/4/2015	9:30:25
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14	22.878478	10.335257	8.472277	11.142207	3/4/2015	9:33:35
15	22.857208	10.548988	9.599514	10.132173	3/4/2015	9:34:39
16	22.87105	10.521417	8.580877	12.211204	3/4/2015	9:35:42
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19	22.609186	10.342037	9.013574	12.007647	3/4/2015	9:38:53
20	21.916961	10.33813	8.327087	10.65533	3/4/2015	9:39:56
21	22.056093	10.437623	9.25425	10.987053	3/4/2015	9:40:59
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28	22.693819	10.087023	8.603369	11.288958	3/4/2015	9:48:23
29	22.805224	10.208855	8.362228	10.903095	3/4/2015	9:49:27
30	22.501084	10.197377	8.656183	12.050976	3/4/2015	9:50:30
31	22.79665	10.21224	8.266316	10.9747	3/4/2015	9:51:34
32	22.535877	10.144146	8.4755	10.610448	3/4/2015	9:52:37
33	21.602696	10.195089	8.551492	10.764816	3/4/2015	9:53:40
34	22.377846	10.267852	8.525885	10.553512	3/4/2015	9:54:44
35	21.88829	9.985969	8.202754	10.468395	3/4/2015	9:55:47
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38	21.947274	10.129796	8.477499	11.766507	3/4/2015	9:58:57
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41	22.990954	10.081076	8.836274	11.036928	3/4/2015	10:02:07
42	22.737439	9.933255	9.590259	12.06029	3/4/2015	10:03:11
43	22.449508	9.994287	8.592295	11.227355	3/4/2015	10:04:14
44	22.556427	10.041094	8.464485	10.727893	3/4/2015	10:05:18
45	22.214543	10.152231	8.765093	11.069707	3/4/2015	10:06:21
46	22.710054	9.784711	8.506352	11.275555	3/4/2015	10:07:24
47	22.599704	9.981823	8.436604	10.154762	3/4/2015	10:08:28
48	23.255874	10.067568	8.700521	10.503401	3/4/2015	10:09:31
49	22.961785	10.210742	8.41594	11.341529	3/4/2015	10:10:34
50	22.794129	10.303283	8.633446	11.880165	3/4/2015	10:11:38
51	22.913396	10.175316	8.564247	10.550678	3/4/2015	10:12:41
52	22.92699	10.185859	8.550838	10.32351	3/4/2015	10:13:44
53	21.951781	10.356047	8.519721	11.192537	3/4/2015	10:14:48
54	22.006864	10.250026	8.289149	10.164823	3/4/2015	10:15:51
55	22.486888	10.165502	8.825539	10.775173	3/4/2015	10:16:54
56	22.075504	10.294001	8.842222	11.748116	3/4/2015	10:17:58
57	22.573308	10.401089	9.170568	11.69473	3/4/2015	10:19:01
58	22.839721	10.459509	9.679899	11.607173	3/4/2015	10:20:04
59	22.48823	10.296116	9.607028	12.222255	3/4/2015	10:21:08
60	22.723464	10.363826	8.849826	11.088667	3/4/2015	10:22:11
AVG	22.66	10.28	8.65	11.07		

Calculated Emission Levels					
NOx (g/BHP-hr)	NOx (lbs/hr)	CO (g/BHP-hr)	CO (lbs/hr)	HCOH Dry (ppm)	HCOH @ 15% O <sub>2</sub> (ppm)
0.19	0.52	0.05	0.15	9.72	5.17

**XTO Energy, Inc.**

LCU #4

Run 2

Record	FTIR Measurements				Date	Time
	NOx Dry	CO ppm Dry	Formaldehyde 191C Wet	H2O% (High) 191C		
1	22.764995	10.49142	8.55386	10.642176	3/4/2015	10:31:52
2	22.710598	10.345672	9.337743	10.88552	3/4/2015	10:32:56
3	22.531519	10.462437	8.621064	10.739295	3/4/2015	10:33:59
4	22.527734	10.479398	8.329891	10.071142	3/4/2015	10:35:02
5	21.786094	10.465133	8.704074	10.006463	3/4/2015	10:36:06
6	22.098934	10.529751	8.862374	11.04976	3/4/2015	10:37:09
7	22.185255	10.433653	8.769223	10.84738	3/4/2015	10:38:12
8	22.083798	10.461418	8.883329	10.792184	3/4/2015	10:39:16
9	22.493267	10.493466	8.503346	11.310485	3/4/2015	10:40:19
10	22.31976	10.427423	8.697191	11.680249	3/4/2015	10:41:22
11	22.529404	10.526569	8.205011	10.131196	3/4/2015	10:42:26
12	21.944288	10.745856	9.308789	10.659764	3/4/2015	10:43:29
13	22.027431	10.69902	9.163995	12.215798	3/4/2015	10:44:32
14	22.647186	10.489699	8.579635	10.570945	3/4/2015	10:45:35
15	22.670667	10.559128	8.496389	10.189503	3/4/2015	10:46:39
16	23.096587	10.475392	8.704924	11.373405	3/4/2015	10:47:42
17	22.236903	10.491354	9.166981	10.901394	3/4/2015	10:48:45
18	22.280366	10.37803	8.86646	10.814932	3/4/2015	10:49:49
19	22.287873	10.556702	8.85633	11.547789	3/4/2015	10:50:52
20	21.356571	10.547751	8.538112	10.208226	3/4/2015	10:51:55
21	21.468768	10.52562	9.187486	11.675745	3/4/2015	10:52:59
22	21.39503	10.52904	9.156338	11.300246	3/4/2015	10:54:02
23	21.408759	10.539488	8.269184	10.172438	3/4/2015	10:55:05
24	21.373267	10.637922	8.854307	11.86171	3/4/2015	10:56:08
25	21.47913	10.427518	8.976703	11.155059	3/4/2015	10:57:12
26	21.79858	10.447124	9.015133	10.996843	3/4/2015	10:58:15
27	21.338771	10.357916	8.915069	10.796738	3/4/2015	10:59:18
28	20.934184	10.474584	9.508474	10.956491	3/4/2015	11:00:22
29	21.303898	10.528892	9.506367	10.534152	3/4/2015	11:01:25
30	21.414184	10.413233	8.468816	10.238875	3/4/2015	11:02:28
31	21.072246	10.450141	8.499596	10.734632	3/4/2015	11:03:32
32	21.003227	10.316448	9.383983	11.089817	3/4/2015	11:04:35
33	20.743922	10.389319	8.586637	10.71045	3/4/2015	11:05:38
34	20.445566	10.3017	9.4009	12.426148	3/4/2015	11:06:41
35	20.696663	10.324908	9.337249	10.647677	3/4/2015	11:07:45
36	20.116071	10.314842	9.276967	11.270446	3/4/2015	11:08:48
37	19.791453	10.500346	9.669558	11.219688	3/4/2015	11:09:51
38	20.363164	10.226831	8.797162	10.021229	3/4/2015	11:10:55
39	21.014451	10.326587	8.86893	10.752604	3/4/2015	11:11:58
40	21.519458	10.01544	8.292801	10.715107	3/4/2015	11:13:01
41	20.862549	10.045724	8.392995	10.670913	3/4/2015	11:14:04
42	20.890084	10.085428	8.115397	9.740375	3/4/2015	11:15:08
43	20.64103	10.206017	9.310814	12.222216	3/4/2015	11:16:11
44	19.804805	10.266417	9.332548	11.398249	3/4/2015	11:17:14
45	20.140728	10.3669	9.246492	11.551551	3/4/2015	11:18:17
46	19.839907	10.268323	8.442279	10.670265	3/4/2015	11:19:21
47	20.058831	10.371883	8.700018	10.975878	3/4/2015	11:20:24
48	20.693454	10.169605	8.764738	10.053586	3/4/2015	11:21:27
49	20.670003	10.062703	9.911485	11.892414	3/4/2015	11:22:31
50	21.074135	10.071721	9.089049	10.490093	3/4/2015	11:23:34
51	20.522548	10.319731	8.952677	10.831359	3/4/2015	11:24:37
52	19.927556	10.277492	8.508207	10.954096	3/4/2015	11:25:40
53	20.160679	10.330926	8.309715	10.244358	3/4/2015	11:26:44
54	20.094604	10.255162	8.184925	10.110975	3/4/2015	11:27:47
55	19.970134	10.546254	8.447903	10.549392	3/4/2015	11:28:50
56	19.996097	10.351893	8.556489	10.403989	3/4/2015	11:29:53
57	19.654486	10.572392	9.344679	12.531021	3/4/2015	11:30:57
58	19.895437	10.310947	8.883362	10.447657	3/4/2015	11:32:00
59	20.339221	10.302538	9.801839	12.60554	3/4/2015	11:33:03
60	20.203705	10.339611	9.167412	10.779645	3/4/2015	11:34:07
AVG	21.21	10.39	8.88	10.92		

Calculated Emission Levels					
NOx (g/BHP-hr)	NOx (lbs/hr)	CO (g/BHP-hr)	CO (lbs/hr)	HCOH Dry (ppm)	HCOH @ 15% O2 (ppm)
0.18	0.49	0.05	0.15	9.96	5.30

XTO Energy, Inc.						
LCU #4						
Run 3						
Record	FTIR Measurements					Date
	NOx Dry	CO ppm Dry	Formaldehyde 191C Wet	H2O% (High) 191C		
1	20.620826	10.265615	7.274046	6.822416	3/4/2015	11:38:36
2	20.144866	10.272164	8.768422	7.810499	3/4/2015	11:39:39
3	20.123274	10.378767	8.719129	9.646968	3/4/2015	11:40:43
4	20.627727	10.195136	8.871812	10.66757	3/4/2015	11:41:46
5	20.618845	10.217537	9.168922	11.113502	3/4/2015	11:42:49
6	20.472123	10.379575	8.805979	10.827217	3/4/2015	11:43:52
7	20.627556	10.454559	9.847107	12.059568	3/4/2015	11:44:56
8	20.855753	10.347013	9.225129	10.511393	3/4/2015	11:45:59
9	20.395057	10.378281	8.971946	10.935477	3/4/2015	11:47:02
10	20.235499	10.300982	8.644168	10.571588	3/4/2015	11:48:05
11	20.01572	10.263586	8.873929	10.604263	3/4/2015	11:49:09
12	19.659841	10.207434	9.53193	11.662457	3/4/2015	11:50:12
13	19.542324	10.235054	8.611896	10.040084	3/4/2015	11:51:15
14	19.233607	10.196843	8.818774	10.577175	3/4/2015	11:52:18
15	19.644744	10.357175	8.6019	10.396099	3/4/2015	11:53:22
16	20.463366	10.230936	8.56644	10.438279	3/4/2015	11:54:25
17	20.272407	10.29446	8.664652	10.288913	3/4/2015	11:55:28
18	19.741174	10.26227	8.309094	10.273394	3/4/2015	11:56:31
19	19.925994	10.22287	8.602529	11.405915	3/4/2015	11:57:35
20	19.475086	10.167103	8.645171	10.904506	3/4/2015	11:58:38
21	19.447411	10.188224	8.223207	10.262358	3/4/2015	11:59:41
22	19.590309	10.314618	8.508874	10.592302	3/4/2015	12:00:44
23	19.507363	10.229428	8.65956	10.387649	3/4/2015	12:01:48
24	18.684815	10.230509	8.466668	10.258346	3/4/2015	12:02:51
25	19.55442	10.186235	8.659167	11.03735	3/4/2015	12:03:54
26	18.936859	10.276631	8.721634	10.452903	3/4/2015	12:04:57
27	19.81825	10.164567	8.267074	10.07153	3/4/2015	12:06:01
28	19.170944	10.258416	9.125798	12.075921	3/4/2015	12:07:04
29	18.676499	10.338577	9.391407	11.721957	3/4/2015	12:08:07
30	18.878717	10.329854	9.246343	11.210182	3/4/2015	12:09:10
31	19.242302	10.273682	10.131468	12.271217	3/4/2015	12:10:14
32	19.548279	10.093629	9.782646	10.765489	3/4/2015	12:11:17
33	19.42593	9.985173	9.355655	10.606127	3/4/2015	12:12:20
34	20.405749	9.939929	8.120541	9.733501	3/4/2015	12:13:23
35	19.419945	10.125787	8.97888	10.218694	3/4/2015	12:14:27
36	19.187774	10.157927	9.71781	11.718078	3/4/2015	12:15:30
37	18.178811	10.16297	10.093749	12.118482	3/4/2015	12:16:33
38	19.157812	10.187985	8.233148	9.778093	3/4/2015	12:17:36
39	18.884317	10.185799	8.222462	10.168212	3/4/2015	12:18:40
40	18.805499	10.28548	8.083688	9.992125	3/4/2015	12:19:43
41	17.911132	10.455156	8.754615	10.341259	3/4/2015	12:20:46
42	17.671729	10.344782	9.688977	11.318461	3/4/2015	12:21:49
43	18.975157	10.301225	9.178355	10.932214	3/4/2015	12:22:53
44	18.452879	10.263785	9.318878	11.142542	3/4/2015	12:23:56
45	19.519908	10.233026	9.344847	10.916761	3/4/2015	12:24:59
46	19.271018	10.290116	9.048756	10.999137	3/4/2015	12:26:02
47	19.451348	10.143176	8.611041	10.78504	3/4/2015	12:27:06
48	19.985383	10.155059	8.731293	10.822082	3/4/2015	12:28:09
49	19.328061	10.250635	8.828718	10.964973	3/4/2015	12:29:12
50	18.71186	10.315183	9.098091	10.997931	3/4/2015	12:30:15
51	18.942842	10.238301	8.978792	10.617012	3/4/2015	12:31:19
52	19.118324	10.495748	8.434006	10.375683	3/4/2015	12:32:22
53	18.745603	10.45325	8.438541	10.086382	3/4/2015	12:33:25
54	17.907017	10.574885	8.840527	10.232623	3/4/2015	12:34:28
55	17.59997	10.652213	8.769233	11.028236	3/4/2015	12:35:32
56	18.210654	10.498886	9.418939	11.408286	3/4/2015	12:36:35
57	18.295217	10.528755	10.045223	12.63513	3/4/2015	12:37:38
58	19.128428	10.60569	9.365554	11.030012	3/4/2015	12:38:41
59	18.785591	10.608595	9.811551	11.474885	3/4/2015	12:39:44
60	18.310246	10.568015	9.742616	11.194183	3/4/2015	12:40:48
AVG	19.36	10.29	8.93	10.71		

Calculated Emission Levels					
NOx (g/BHP-hr)	NOx (lbs/hr)	CO (g/BHP-hr)	CO (lbs/hr)	HCOH Dry (ppm)	HCOH @ 15% O2 (ppm)
0.16	0.46	0.05	0.15	10.00	5.37

## **APPENDIX B**

### Raw Calibration Data

#### BACKGROUND

Date	Time	NO 191C open	NO2 191C open	H2O% (high) 191C	Formaldehyde 191C	Ethylene 191C TE open	Propane 191C open	Acetaldehyde 191C open	CO ppm 191C (10#) open	CO ppm 191C (10#) open CO ppm Dry	CO%191C	Nox Wet	Nox Dry	NM HC C3
3/4/2015	8:57:05	0.194405	0.184139	-0.010447	-0.155665	-0.172185	2.205913	-0.020697	0.183233	0.183214	-0.004543	0.362555	0.201374	2.189566
3/4/2015	8:57:13	0.205948	0.171426	-0.020106	-0.155111	-0.172185	2.205913	-0.020697	0.183233	0.183212	-0.004544	0.201376	0.009152	0.209879
3/4/2015	8:57:21	0.237979	0.059031	-0.010991	0.186785	-1.405079	0.407095	-0.052554	0.137064	0.137043	0.02176	0.29401	0.209879	0.020948
3/4/2015	8:57:29	0	0	0	0	0	0	0	0	0	0	0	0	0
3/4/2015	8:58:14	0.110691	0.038089	-0.008986	-0.191786	-2.300105	0.360793	0.150778	0.183235	0.183215	0.013350	0.14545	0.145887	0.067896
3/4/2015	8:58:22	-0.008957	0.042059	-0.001452	-0.000045	-0.927225	1.376779	0.417598	0.179649	0.179627	0.011350	0.213199	0.009159	0.213298
3/4/2015	8:58:30	-0.008575	0.075133	-0.000474	-0.032865	-1.107547	1.382599	0.338909	0.178625	0.178607	-0.01007	-0.01044	1.233298	
3/4/2015	8:58:38	0.029991	0.029991	0.029991	0.029991	-1.879386	2.252998	0.351109	0.000011	0.000011	0.001414	0.044822	0.044822	2.218060
3/4/2015	8:58:46	0.040996	-0.072793	0.020299	0.109353	-1.008638	0.360298	1.484449	0.137064	0.137043	0.02173	0.211723	0.021723	0.211723
3/4/2015	8:58:54	-0.026707	0.064554	-0.010103	0.170406	-1.363242	1.660041	-0.703677	0.087332	0.087332	-0.005399	0.037147	0.037147	1.801030
3/4/2015	8:59:02	-0.008986	0.029991	0.029991	0.230299	-1.84174	0.360298	-0.020744	-0.051754	-0.051754	0.001365	-0.351999	-0.351999	1.841271
3/4/2015	8:59:10	-0.109023	-0.007868	-0.002146	0.07657	0.024180	1.511722	-0.131093	0.060543	0.060543	0.011809	0.009097	0.009097	1.841271
3/4/2015	8:59:18	0.005484	-0.059361	-0.004115	0.082798	-1.835767	0.635991	-0.802407	0.163828	0.163821	0.022905	-0.050667	-0.050667	0.102345
3/4/2015	8:59:26	-0.186612	-0.047971	0.029998	0.068076	-1.779533	1.527097	-0.364038	0.124404	0.124404	0.018998	-0.221343	-0.221343	1.424955

#### PRE DIRECT CAL

Date	Time	CO ppm 191C (10#) open	Nox Wet	Propane 191C open	Date	Time	Ethylene 191C TE	Date	Time	Acetaldehyde 191C open
3/4/2015	8:59:34	133.111928	160.078558	162.853109	3/4/2015	8:00:33	22.840439	3/4/2015	8:00:48	8.840593
3/4/2015	8:59:42	498.849402	472.399278	457.259919	3/4/2015	8:00:40	95.889029	3/4/2015	8:01:08	30.813113
3/4/2015	8:59:50	502.998527	506.869787	494.59112	3/4/2015	8:04:08	99.375903	3/4/2015	8:01:14	32.852303
3/4/2015	8:59:58	520.219796	500.219796	499.899999	3/4/2015	8:04:16	102.550641	3/4/2015	8:01:22	32.186041
3/4/2015	9:00:05	508.876253	510.28533	490.000058	3/4/2015	8:04:24	127.307179	3/4/2015	8:01:30	32.80705
3/4/2015	9:00:13	505.781091	510.481141	497.162777	3/4/2015	8:04:32	101.515761	3/4/2015	8:01:38	31.772954
3/4/2015	9:00:21	520.820339	500.820339	499.400111	3/4/2015	8:04:40	100.329293	3/4/2015	8:01:46	31.856667
3/4/2015	9:00:29	504.200059	509.704728	495.730516	3/4/2015	8:04:48	100.209113	3/4/2015	8:01:54	32.390666
3/4/2015	9:00:37	504.197942	508.867387	494.255124	3/4/2015	8:04:56	101.289423	3/4/2015	8:05:04	101.950485
					3/4/2015	8:05:12	101.758902			

#### NO2 CAL

Date	Time	NO2 191C open
3/4/2015	9:02:18	30.486778
3/4/2015	9:02:26	141.072061
3/4/2015	9:02:34	141.072061
3/4/2015	9:02:41	156.077567
3/4/2015	9:02:49	153.797183
3/4/2015	9:02:57	152.626604
3/4/2015	9:03:05	153.820573
3/4/2015	9:03:13	153.820527
3/4/2015	9:03:21	154.225056
3/4/2015	9:03:29	153.820333

#### PRE SYSTEM CAL

Date	Time	CO ppm 191C (10#) open	Nox Wet	Propane 191C open	Date	Time	Ethylene 191C TE	Date	Time	Acetaldehyde 191C open
3/4/2015	9:05:58	0.797775	12.016077	13.530911	3/4/2015	9:00:18	6.265012	3/4/2015	9:07:59	18.122068
3/4/2015	9:06:06	0.91079	1.210431	0.347239	3/4/2015	9:09:34	95.444441	3/4/2015	9:07:59	31.64451
3/4/2015	9:06:14	0.820847	0.820218	1.178691	3/4/2015	9:09:42	101.809136	3/4/2015	9:08:06	20.807381
3/4/2015	9:06:22	50.200203	58.563032	48.403203	3/4/2015	9:09:50	103.431029	3/4/2015	9:08:14	31.875497
3/4/2015	9:06:30	451.07574	452.771361	448.515848	3/4/2015	9:09:58	102.554318	3/4/2015	9:08:22	32.330397
3/4/2015	9:06:37	464.215033	487.996691	478.582989	3/4/2015	9:10:06	103.475798	3/4/2015	9:08:30	32.907735
3/4/2015	9:06:45	495.492203	492.583598	493.828332	3/4/2015	9:10:14	103.475798	3/4/2015	9:08:38	33.140193
3/4/2015	9:06:53	503.553053	503.832009	492.509734	3/4/2015	9:10:22	103.969961	3/4/2015	9:08:46	32.330397
3/4/2015	9:07:01	504.821919	505.149751	496.067029	3/4/2015	9:10:30	104.747666	3/4/2015	9:08:54	34.229798
3/4/2015	9:07:09	500.777272	503.553053	496.055021	3/4/2015	9:10:38	103.130666			
3/4/2015	9:07:17	507.222477	509.577798	495.997791						

## SAMPLE SPIKE RECOVERY

Date	Time	CO2% 191C	CO ppm 191C (left) span	CO ppm 191C (right) span	Propane 191C span
3/4/2015	9:11:02	6.355340	10.0215	20.11273	24.49995
3/4/2015	9:15:37	6.111917	9.735957	19.83498	22.733901
3/4/2015	9:16:45	6.057796	9.564596	19.821131	22.463673
3/4/2015	9:15:53	6.045247	9.484791	18.749294	21.99994
3/4/2015	9:16:17	6.126468	9.291165	18.996113	21.710434
3/4/2015	9:16:25	6.093546	9.014458	18.357326	22.255983
3/4/2015	9:16:33	6.073202	7.773252	18.500001	17.777777
3/4/2015	9:16:41	2.963946	4.639703	9.42998	14.05031
3/4/2015	9:16:49	4.850420	7.443132	13.033059	18.597965
3/4/2015	9:16:57	5.045686	8.839321	18.633958	20.743331
3/4/2015	9:17:04	5.457097	14.020232	21.137908	20.020218
3/4/2015	9:17:12	5.591852	44.26548	52.053351	53.926295
3/4/2015	9:17:20	5.140171	5.111793	58.453149	64.699712
3/4/2015	9:17:28	5.477893	9.342254	57.453113	61.020218
3/4/2015	9:17:36	5.305296	68.683608	76.122512	79.899987
3/4/2015	9:17:44	5.347550	79.142001	85.132779	90.479153
3/4/2015	9:17:52	5.200553	73.839118	80.130302	81.020218
3/4/2015	9:18:00	5.250988	50.949569	55.709333	60.499568
3/4/2015	9:18:08	5.150211	80.130302	70.221964	74.515967
3/4/2015	9:18:24	5.155098	56.461126	65.935085	67.566973
3/4/2015	9:18:32	5.062039	57.520954	65.700004	69.5

## ACETALDEHYDE SPIKE RECOVERY

Date	Time	CO2% 191C	Acetaldehyde 191C span
3/4/2015	9:11:02	6.270453	-0.476439
3/4/2015	9:11:10	6.406053	-0.954195
3/4/2015	9:11:18	6.455543	-0.275004
3/4/2015	9:11:26	6.457965	-0.077799
3/4/2015	9:11:34	6.459131	-0.507174
3/4/2015	9:11:42	6.459203	-0.445388
3/4/2015	9:11:50	6.448112	0.811156
3/4/2015	9:11:58	6.434777	-0.291593
3/4/2015	9:12:06	6.435553	-1.099965
3/4/2015	9:12:14	6.434393	0.432704
3/4/2015	9:12:22	6.429678	0.540055
3/4/2015	9:12:30	6.429119	-1.117976
3/4/2015	9:12:37	5.765759	0.085775
3/4/2015	9:12:45	2.986574	-0.012998
3/4/2015	9:12:53	2.985248	0.532957
3/4/2015	9:13:01	2.501185	15.562773
3/4/2015	9:13:09	4.324244	10.071831
3/4/2015	9:13:17	5.397491	4.529982
3/4/2015	9:13:25	5.459524	3.533379
3/4/2015	9:13:33	5.407974	3.206538
3/4/2015	9:13:41	5.485538	4.013
3/4/2015	9:13:49	5.485546	3.449728
3/4/2015	9:13:57	5.695448	2.432857
3/4/2015	9:14:05	5.695476	2.069306
3/4/2015	9:14:13	5.769528	1.595279
3/4/2015	9:14:21	5.864208	1.820187
3/4/2015	9:14:29	5.864128	1.822059
3/4/2015	9:14:37	5.136523	1.386273
3/4/2015	9:14:45	5.948623	1.261911
3/4/2015	9:14:53	5.816988	1.826668
3/4/2015	9:15:00	5.998721	1.721357
3/4/2015	9:15:08	5.947701	1.337297

## POST DIRECT CAL

Date	Time	CO ppm 191C (left) span	Nox Wt.	CO ppm 191C span	Date	Time	Acetaldehyde 191C span
3/4/2015	12:48:27	-0.055113	-0.110039	-0.024414	3/4/2015	12:50:14	2.889935
3/4/2015	12:48:35	0.060119	-0.395336	1.078904	3/4/2015	12:50:22	26.571663
3/4/2015	12:48:43	53.937508	54.000003	56.361365	3/4/2015	12:50:30	32.49749
3/4/2015	12:48:50	389.89797	373.995035	380.000003	3/4/2015	12:50:38	31.494669
3/4/2015	12:48:58	485.633374	493.806204	481.276584	3/4/2015	12:50:46	32.990151
3/4/2015	12:49:06	402.95749	407.95787	401.547767	3/4/2015	12:50:54	31.274769
3/4/2015	12:49:14	494.109435	501.547769	496.110586	3/4/2015	12:51:02	32.755506
3/4/2015	12:49:22	494.85723	501.832061	494.842787	3/4/2015	12:51:10	32.799218
3/4/2015	12:49:30	493.800218	501.103672	496.166201			
3/4/2015	12:49:38	494.85723	502.055565	497.755501			
3/4/2015	12:49:46	496.587182	503.298532	500.709981			
3/4/2015	12:49:54	498.719864	503.827814	496.123468			

## POST SYSTEM CAL

Date	Time	Ethylene 191C TE
3/4/2015	12:42:20	7.189044
3/4/2015	12:42:28	52.317118
3/4/2015	12:42:35	91.025708
3/4/2015	12:42:43	95.4345
3/4/2015	12:42:51	98.863796
3/4/2015	12:42:59	99.490112
3/4/2015	12:43:07	99.180303
3/4/2015	12:43:15	101.569338
3/4/2015	12:43:23	102.172325
3/4/2015	12:43:31	101.582835
3/4/2015	12:43:39	101.281299

### FTIR QA/QC SUMMARY

SAMPLE RECOVERY CALCULATIONS																
Period	Spike #	Concentration of CO Cylinder	Concentration of Propane Cylinder	Concentration of NO Cylinder	Stack CO2 Concentration	Stack CO Concentration	Stack NO Concentration	Stack Propane Concentration	Stack + Spike CO2 Concentration	Stack + CO Concentration	Stack + NO Concentration	Stack + Propane Concentration	DF Calculated	% Recovery CO	% Recovery NO	% Recovery Propane
PRE TEST	1	499.9	499.1	504.3	6.0	9.3	18.8	21.9	5.5	39.7	47.3	51.4	0.074	84.1%	80.0%	84.3%

ACETALDEHYDE SAMPLE RECOVERY CALCULATIONS						
Period	Spike #	Concentration of CH3CHO Cylinder	Stack CO2 Concentration	Stack CH3CHO Concentration	Stack + Spike CO2 Concentration	DF Calculated** % Recovery CH3CHO
PRE TEST	1	33.1	6.3	-0.5	5.8	1.8 0.075 89.1%

PRE SYSTEM CAL			
Sensor	System Response (ppm)	Cal Level (ppm)	Cal Recovery (%)
NOx	509.6	504.1	1.1
CO	507.2	499.9	1.5
Propane	496.0	499.1	-0.6
*Ethylene	103.1	102.0	1.1
Acetaldehyde	34.2	33.1	3.4

PRE DIRECT CAL					
Sensor	Analyzer Response (ppm)	Cal Level (ppm)	Zero Response (ppm)	Cal Error (%)	Zero Error (%)
NOx	508.9	504.1	0.4	0.9	0.1
CO	504.2	499.9	-0.1	0.9	-0.01
Propane	494.3	499.1	0.4	-1.0	0.1
Ethylene	101.8	102.0	-0.4	-0.2	-0.4
Acetaldehyde	32.4	33.1	-0.4	-2.1	-1.2

POST DIRECT CAL					
Sensor	Analyzer Response (ppm)	Cal Level (ppm)	Zero Response (ppm)	Cal Error (%)	Zero Error (%)
NOx	503.1	504.1	0.3	-0.1	0.1
CO	495.7	499.9	0.1	-0.8	0.02
Propane	496.1	499.1	0.4	-0.6	0.1
Acetaldehyde	32.8	33.1	0.4	-0.9	1.2

POST SYSTEM CAL			
Sensor	System Response (ppm)	Cal Level (ppm)	Cal Recovery (%)
*Ethylene	101.3	102.0	-0.7

\*CTB Scans are conducted with Ethylene through the sample line.

\*\*Dilution Factor slightly above normal.

## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA Protocol

Part Number: E05NI99E15A0000 Reference Number: 54-124410001-2  
Cylinder Number: CC432824 Cylinder Volume: 144.4 CF  
Laboratory: ASG - Chicago - IL Cylinder Pressure: 2015 PSIG  
PGVP Number: B12013 Valve Outlet: 660  
Gas Code: CH4,CO,NO,PPN,BALN Certification Date: Dec 23, 2013

Expiration Date: Dec 23, 2021

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	500.0 PPM	504.5 PPM	G1	+/- 1.4% NIST Traceable	12/16/2013, 12/23/2013
CARBON MONOXIDE	500.0 PPM	499.9 PPM	G1	+/- 1.0% NIST Traceable	12/16/2013
METHANE	500.0 PPM	509.7 PPM	G1	+/- 0.7% NIST Traceable	12/17/2013
NITRIC OXIDE	500.0 PPM	504.1 PPM	G1	+/- 1.4% NIST Traceable	12/16/2013, 12/23/2013
PROPANE	500.0 PPM	499.1 PPM	G1	+/- 1% NIST Traceable	12/19/2013
NITROGEN	Balance				

#### CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
CO	12062405	CC157169	487.1 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Jun 22, 2018
CH4	10060909	CC320616	500.5 PPM METHANE/NITROGEN	+/- 0.6%	Aug 07, 2016
NTRM/NO	12061023	CC359411	500.7 PPM NITRIC OXIDE/NITROGEN	+/- 0.5%	Feb 16, 2018
NO2	124206889130	CC323209	4.824 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.0%	Oct 25, 2015
NTRM	10060514	CC281296	495.3 PPM PROPANE/AIR	+/- 0.5%	Feb 19, 2016

#### ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nexus 470 AEP0000428	FTIR	Nov 21, 2013
Nicolet 6700 AHR0801332	FTIR	Nov 22, 2013
Nexus 470 AEP0000428	FTIR	Dec 21, 2013
Nexus 470 AEP0000428	FTIR	Dec 21, 2013
MKS Multigas 17707558	FTIR	Nov 25, 2013

Triad Data Available Upon Request

Notes:

## CERTIFICATE OF ANALYSIS Grade of Product: EPA Protocol

Part Number: E03NI99E15A2059 Reference Number: 54-124356582-2  
Cylinder Number: CC259116 Cylinder Volume: 144.4 Cubic Feet  
Laboratory: ASG - Chicago - IL Cylinder Pressure: 2015 PSIG  
PGVP Number: B12013 Valve Outlet: 660  
Gas Code: NO2 Analysis Date: Feb 08, 2013

Expiration Date: Feb 08, 2016

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
NITROGEN DIOXIDE	150.0 PPM	152.6 PPM	G1	+/- 2%
NITROGEN	Balance			
CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No	Concentration	Expiration Date
GMIS/NO2	124320129107	CC411587	195.2 PPM NITROGEN DIOXIDE/NITROGEN	Sep 27, 2015
ANALYTICAL EQUIPMENT				
Instrument/Make/Model	Analytical Principle			Last Multipoint Calibration
O2-1 HORIBA MPA-510 3VUYL9NR	Paramagnetic			Jan 08, 2013

Triad Data Available Upon Request

Notes: OXYGEN 1000PPM

Approved for Release

## CERTIFICATE OF ANALYSIS

### Grade of Product: PRIMARY STANDARD

Part Number:	X02NI99P15AD524	Reference Number:	48-124465798-5
Cylinder Number:	XC001344B	Cylinder Volume:	144.4 CF
Laboratory:	ASG - Los Angeles - CA	Cylinder Pressure:	2015 PSIG
Analysis Date:	Dec 02, 2014	Valve Outlet:	350
Lot Number:	48-124465798-5		

Primary Standard Gas Mixtures are traceable to N.I.S.T. weights and/or N.I.S.T. Gas Mixture reference materials.

### ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration (Mole %)	Analytical Uncertainty
ETHYLENE	100.0 PPM	102.0 PPM	+/- 1%
NITROGEN	Balance		



Approved for Release

**Airgas Specialty Gases**

616 Miller Cut Off Rd

Laporte, TX 77571

281-842-6900

Airgas.com

**CERTIFICATE OF ANALYSIS****Grade of Product: CERTIFIED STANDARD-SPEC**

Customer: ROCK SPRINGS, WY  
Part Number: X02NI99C15AC0A0  
Cylinder Number: CC79089  
Laboratory: ASG - LaPorte Mix (SAP) - TX  
Analysis Date: Dec 31, 2014  
Lot Number: 126-400466822-1

Reference Number: 126-400466822-1  
Cylinder Volume: 144.4 Cubic Feet  
Cylinder Pressure: 2015 PSIG  
Valve Outlet: 350SS

Expiration Date: Dec 31, 2015

Product composition verified by direct comparison to calibration standards traceable to N.I.S.T. weights and/or N.I.S.T. Gas Mixture reference materials.

**ANALYTICAL RESULTS**

Component	Requested Concentration	Actual Concentration (Mole %)	Analytical Uncertainty
ACETALDEHYDE	30.00 PPM	33.09 PPM	+/- 5%
NITROGEN	Balance		

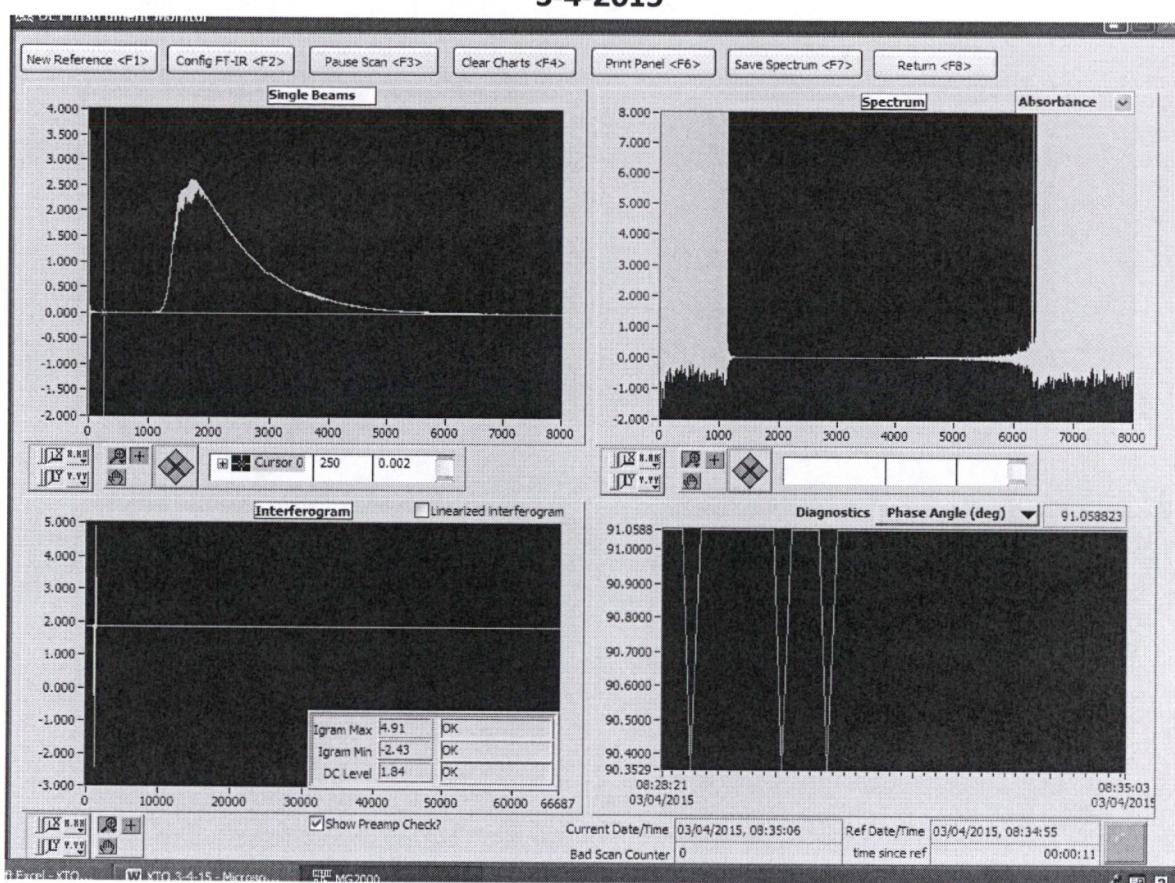
**Notes:**

ROCK SPRINGS, WY

  
Approved for Release

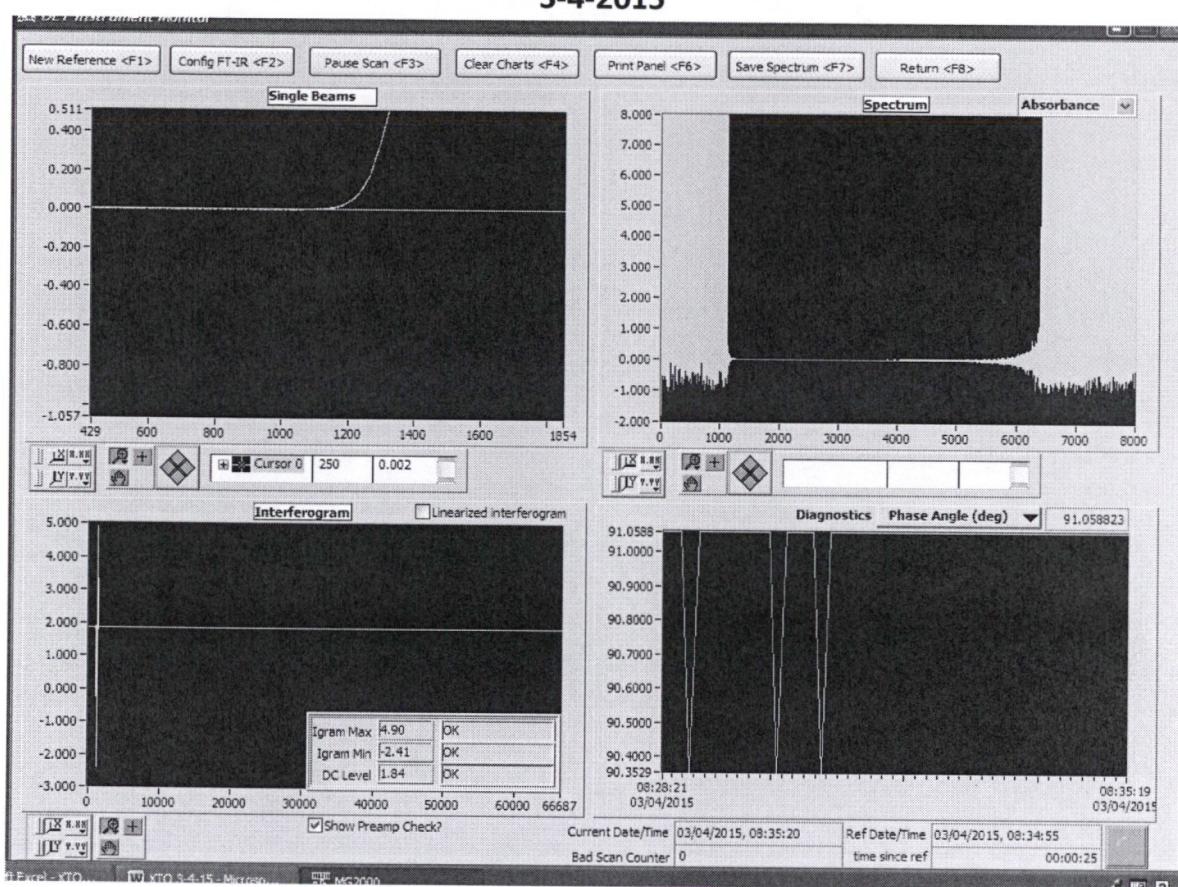
# XTO – Little Canyon

3-4-2015



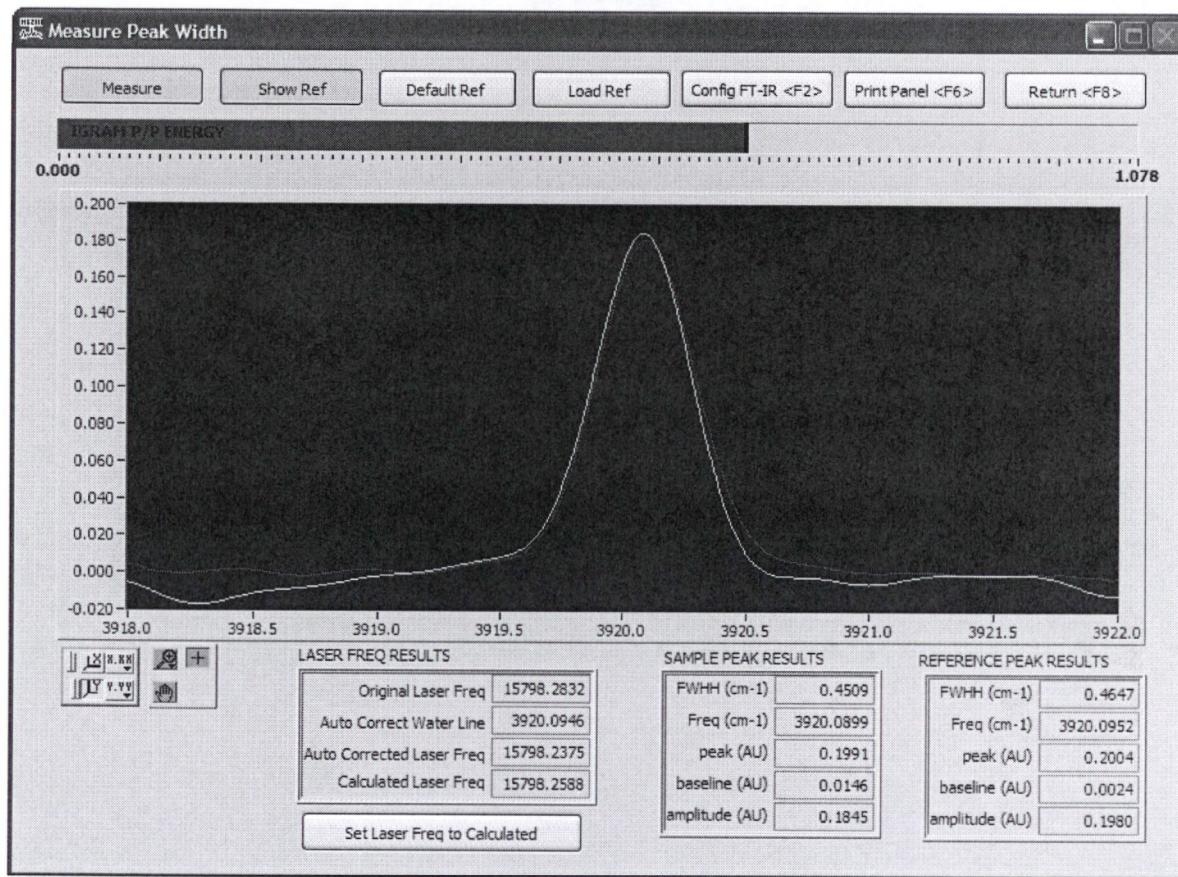
# XTO – Little Canyon

3-4-2015



## XTO – Little Canyon

3-4-2015



**Instrument Resolution** – FWHH – 0.4509 cm<sup>-1</sup> which is < 0.55 cm<sup>-1</sup> (therefore meets ASTM)

**Water Frequency** – Freq – 3920.0899 cm<sup>-1</sup> which is +/- 0.075 of 3920.0952 cm<sup>-1</sup> (therefore meets ASTM)

**Please note:** FWHH is the Full Width at Half Height of the resolution. The frequency position is only calculating the center line for one water line in the spectrum. MKS uses 3920.0952 cm<sup>-1</sup> since it is a single water line.

**CO/NO/NO<sub>2</sub>/Formaldehyde FTIR Instrument Noise-Limited Minimum Detectable Concentration -  
MDC#2**

Noise Equivalent Absorbance Data				
Spectrum	CO	NO	NO <sub>2</sub>	Formaldehyde
XTO LCC-4 3-4-15_000007.LAB	0.18	-0.09	0.08	-0.03
XTO LCC-4 3-4-15_000008.LAB	0.00	0.02	0.02	-0.09
XTO LCC-4 3-4-15_000009.LAB	0.14	0.05	-0.06	0.11
XTO LCC-4 3-4-15_000010.LAB	0.10	-0.03	0.06	0.17
XTO LCC-4 3-4-15_000011.LAB	-0.05	-0.30	-0.05	0.25
XTO LCC-4 3-4-15_000012.LAB	0.00	-0.11	-0.01	0.08
XTO LCC-4 3-4-15_000013.LAB	0.16	0.01	-0.06	0.08
XTO LCC-4 3-4-15_000014.LAB	0.12	-0.18	-0.04	0.01
<b>Noise Equivalent Absorbance (Standard Deviation)</b>	<b>0.08</b>	<b>0.10</b>	<b>0.05</b>	<b>0.10</b>
<b>MDC #2</b>	<b>0.23</b>	<b>0.31</b>	<b>0.14</b>	<b>0.29</b>

## **APPENDIX C**

# G3516

GAS COMPRESSION APPLICATION

## GAS ENGINE SITE SPECIFIC TECHNICAL DATA XTO - LCU #4



ENGINE SPEED (rpm):	1350	RATING STRATEGY:	STANDARD
COMPRESSION RATIO:	8:1	RATING LEVEL:	CONTINUOUS
AFTERCoolER TYPE:	SCAC	FUEL SYSTEM:	HPG IMPCO
AFTERCoolER WATER INLET (°F):	130		WITH AIR FUEL RATIO CONTROL
JACKET WATER OUTLET (°F):	210		
ASPIRATION:	TA		
COOLING SYSTEM:	JW+OC, AC	FUEL:	Field Gas
CONTROL SYSTEM:	ADEM3	FUEL PRESSURE RANGE(psig):	35.0-40.0
EXHAUST MANIFOLD:	ASWC	FUEL METHANE NUMBER:	62.1
COMBUSTION:	LOW EMISSION	FUEL LHV (Btu/scf):	1027
NOx EMISSION LEVEL (g/bhp-hr NOx):	2.0	ALTITUDE(ft):	5278
SET POINT TIMING:	27	MAXIMUM INLET AIR TEMPERATURE(°F):	32
		STANDARD RATED POWER:	1340 bhp@1400rpm

RATING	(WITHOUT FAN)	NOTES	LOAD	MAXIMUM RATING			SITE RATING AT MAXIMUM INLET AIR TEMPERATURE		
				100%	100%	75%	52%		
ENGINE POWER	(WITHOUT FAN)	(1)	bhp	1292	1292	969	670		
INLET AIR TEMPERATURE			°F	32	32	32	32		

ENGINE DATA						
FUEL CONSUMPTION (LHV)	(2)	Btu/bhp-hr	7697	7697	7922	8395
FUEL CONSUMPTION (HHV)	(2)	Btu/bhp-hr	8505	8505	8754	9276
AIR FLOW (@inlet air temp, 14.7 psia)	(WET)	ft3/min	2513	2513	1894	1344
AIR FLOW	(WET)	lb/hr	12163	12163	9165	6503
FUEL FLOW (60°F, 14.7 psia)	(3)(4)	scfm	161	161	125	91
INLET MANIFOLD PRESSURE	(3)(4)	in Hg(abs)	68.7	68.7	54.1	39.7
EXHAUST TEMPERATURE - ENGINE OUTLET	(5)	°F	907	907	906	909
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia)	(6)	ft3/min	7553	7553	5695	4060
EXHAUST GAS MASS FLOW	(WET)	lb/hr	12642	12642	9535	6774

EMISSIONS DATA - ENGINE OUT						
NOx (as NO2)	(8)(9)	g/bhp-hr	2.00	2.00	2.00	2.00
CO	(8)(9)	g/bhp-hr	2.25	2.25	2.35	2.50
THC (mol. wt. of 15.84)	(8)(9)	g/bhp-hr	2.43	2.43	2.53	2.67
NMHC (mol. wt. of 15.84)	(8)(9)	g/bhp-hr	0.63	0.63	0.66	0.69
NMNEHC (VOCs) (mol. wt. of 15.84)	(8)(9)(10)	g/bhp-hr	0.42	0.42	0.44	0.47
HCHO (Formaldehyde)	(8)(9)	g/bhp-hr	0.22	0.22	0.22	0.23
CO2	(8)(9)	g/bhp-hr	507	507	515	539
EXHAUST OXYGEN	(8)(11)	% DRY	7.8	7.8	7.8	7.5

HEAT REJECTION						
HEAT REJ. TO JACKET WATER (JW)	(12)	Btu/min	42326	42326	35191	29246
HEAT REJ. TO ATMOSPHERE	(12)	Btu/min	5123	5123	4270	3480
HEAT REJ. TO LUBE OIL (OC)	(12)	Btu/min	6312	6312	5248	4362
HEAT REJ. TO AFTERCOOLER (AC)	(12)(13)	Btu/min	8645	8645	5469	1987

COOLING SYSTEM SIZING CRITERIA						
TOTAL JACKET WATER CIRCUIT (JW+OC)	(13)	Btu/min	54134			
TOTAL AFTERCOOLER CIRCUIT (AC)	(13)(14)	Btu/min	9078			

A cooling system safety factor of 0% has been added to the cooling system sizing criteria.

### CONDITIONS AND DEFINITIONS

Engine rating obtained and presented in accordance with ISO 3046/1, adjusted for fuel, site altitude and site inlet air temperature. 100% rating at maximum inlet air temperature is the maximum engine capability for the specified fuel at site altitude and maximum site inlet air temperature. Maximum rating is the maximum capability at the specified aftercooler inlet temperature for the specified fuel at site altitude and reduced inlet air temperature. Lowest load point is the lowest continuous duty operating load allowed. No overload permitted at rating shown.

For notes information consult page three.

Run 1 - intake man press -> 21.0 psi -> 42.76 in Hg

$$Patm = 24.63 \text{ in Hg}$$

$$Pabs = 67.39 \text{ in Hg}$$

by linear interpolation, est BHP => 1263.0 BHP

# G3516

GAS COMPRESSION APPLICATION

## GAS ENGINE SITE SPECIFIC TECHNICAL DATA XTO - LCU #4



ENGINE SPEED (rpm):	1350	RATING STRATEGY:	STANDARD
COMPRESSION RATIO:	8:1	RATING LEVEL:	CONTINUOUS
AFTERTOOLER TYPE:	SCAC	FUEL SYSTEM:	HPG IMPCO
AFTERTOOLER WATER INLET (°F):	130		WITH AIR FUEL RATIO CONTROL
JACKET WATER OUTLET (°F):	210		
ASPIRATION:	TA		
COOLING SYSTEM:	JW+OC, AC	FUEL:	Field Gas
CONTROL SYSTEM:	ADEM3	FUEL PRESSURE RANGE(psig):	35.0-40.0
EXHAUST MANIFOLD:	ASWC	FUEL METHANE NUMBER:	62.1
COMBUSTION:	LOW EMISSION	FUEL LHV (Btu/scf):	1027
NOx EMISSION LEVEL (g/bhp-hr NOx):	2.0	ALITUDE(ft):	5278
SET POINT TIMING:	27	MAXIMUM INLET AIR TEMPERATURE(°F):	32
		STANDARD RATED POWER:	1340 bhp@1400rpm

RATING	NOTES	LOAD	MAXIMUM RATING	SITE RATING AT MAXIMUM INLET AIR TEMPERATURE	100%	100%	75%	52%
ENGINE POWER (WITHOUT FAN)	(1)	bhp °F	1292	1292	969	670	32	32

ENGINE DATA						
FUEL CONSUMPTION (LHV)	(2)	Btu/bhp-hr	7697	7697	7922	8395
FUEL CONSUMPTION (HHV)	(2)	Btu/bhp-hr	8505	8505	8754	9276
AIR FLOW (@inlet air temp, 14.7 psia)	(WET)	ft3/min	2513	2513	1894	1344
AIR FLOW	(WET)	lb/hr	12163	12163	9165	6503
FUEL FLOW (60°F, 14.7 psia)	(3)(4)	scfm	161	161	125	91
INLET MANIFOLD PRESSURE	(5)	in Hg(abs)	68.7	68.7	54.1	39.7
EXHAUST TEMPERATURE - ENGINE OUTLET	(6)	°F	907	907	906	909
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia)	(7)(4)	ft3/min	7553	7553	5695	4060
EXHAUST GAS MASS FLOW	(7)(4)	lb/hr	12642	12642	9535	6774

EMISSIONS DATA - ENGINE OUT						
NOx (as NO2)	(8)(9)	g/bhp-hr	2.00	2.00	2.00	2.00
CO	(8)(9)	g/bhp-hr	2.25	2.25	2.35	2.50
THC (mol. wt. of 15.84)	(8)(9)	g/bhp-hr	2.43	2.43	2.53	2.67
NMHC (mol. wt. of 15.84)	(8)(9)	g/bhp-hr	0.63	0.63	0.66	0.69
NMNEHC (VOCs) (mol. wt. of 15.84)	(8)(9)(10)	g/bhp-hr	0.42	0.42	0.44	0.47
HCHO (Formaldehyde)	(8)(9)	g/bhp-hr	0.22	0.22	0.22	0.23
CO2	(8)(9)	g/bhp-hr	507	507	515	539
EXHAUST OXYGEN	(8)(11)	% DRY	7.8	7.8	7.8	7.5

HEAT REJECTION						
HEAT REJ. TO JACKET WATER (JW)	(12)	Btu/min	42326	42326	35191	29246
HEAT REJ. TO ATMOSPHERE	(12)	Btu/min	5123	5123	4270	3480
HEAT REJ. TO LUBE OIL (OC)	(12)	Btu/min	6312	6312	5248	4362
HEAT REJ. TO AFTERCOOLER (AC)	(12)(13)	Btu/min	8645	8645	5469	1987

COOLING SYSTEM SIZING CRITERIA			
TOTAL JACKET WATER CIRCUIT (JW+OC)	(13)	Btu/min	54134
TOTAL AFTERCOOLER CIRCUIT (AC)	(13)(14)	Btu/min	9078

A cooling system safety factor of 0% has been added to the cooling system sizing criteria.

### CONDITIONS AND DEFINITIONS

Engine rating obtained and presented in accordance with ISO 3046/1, adjusted for fuel, site altitude and site inlet air temperature. 100% rating at maximum inlet air temperature is the maximum engine capability for the specified fuel at site altitude and maximum site inlet air temperature. Maximum rating is the maximum capability at the specified aftercooler inlet temperature for the specified fuel at site altitude and reduced inlet air temperature. Lowest load point is the lowest continuous duty operating load allowed. No overload permitted at rating shown.

For notes information consult page three.

Run 2 - intake man press -> 21.0 psi -> 42.76 in Hg

$$Patm = 24.66 \text{ in Hg}$$

$$Pabs = 67.42 \text{ in Hg}$$

by linear interpolation, est BHP => 1263.7 BHP

# G3516

GAS COMPRESSION APPLICATION

## GAS ENGINE SITE SPECIFIC TECHNICAL DATA XTO - LCU #4



ENGINE SPEED (rpm):	1350	RATING STRATEGY:	STANDARD
COMPRESSION RATIO:	8:1	RATING LEVEL:	CONTINUOUS
AFTERTOOLER TYPE:	SCAC	FUEL SYSTEM:	HPG IMPCO
AFTERTOOLER WATER INLET (°F):	130		WITH AIR FUEL RATIO CONTROL
JACKET WATER OUTLET (°F):	210		
ASPIRATION:	TA		
COOLING SYSTEM:	JW+OC, AC		Field Gas
CONTROL SYSTEM:	ADEM3		35.0-40.0
EXHAUST MANIFOLD:	ASWC		62.1
COMBUSTION:	LOW EMISSION		1027
NOx EMISSION LEVEL (g/bhp-hr NOx):	2.0		5278
SET POINT TIMING:	27		32
		STANDARD RATED POWER:	1340 bhp@1400rpm

RATING	NOTES	LOAD	MAXIMUM RATING	SITE RATING AT MAXIMUM INLET AIR TEMPERATURE		
ENGINE POWER (WITHOUT FAN)	(1)	bhp	1292	100%	100%	75% 52%
INLET AIR TEMPERATURE		°F	32	32	32	32

ENGINE DATA						
FUEL CONSUMPTION (LHV)	(2)	Btu/bhp-hr	7697	7697	7922	8395
FUEL CONSUMPTION (HHV)	(2)	Btu/bhp-hr	8505	8505	8754	9276
AIR FLOW (@inlet air temp, 14.7 psia)	(WET)	ft³/min	2513	2513	1894	1344
AIR FLOW	(WET)	lb/hr	12163	12163	9165	6503
FUEL FLOW (60°F, 14.7 psia)		scfm	161	161	125	91
INLET MANIFOLD PRESSURE		in Hg(abs)	68.7	68.7	54.1	39.7
EXHAUST TEMPERATURE - ENGINE OUTLET	(5)	°F	907	907	906	909
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia)	(6)	ft³/min	7553	7553	5695	4060
EXHAUST GAS MASS FLOW	(WET)	lb/hr	12642	12642	9535	6774

EMISSIONS DATA - ENGINE OUT						
NOx (as NO2)	(8)(9)	g/bhp-hr	2.00	2.00	2.00	2.00
CO	(8)(9)	g/bhp-hr	2.25	2.25	2.35	2.50
THC (mol. wt. of 15.84)	(8)(9)	g/bhp-hr	2.43	2.43	2.53	2.67
NMHC (mol. wt. of 15.84)	(8)(9)	g/bhp-hr	0.63	0.63	0.66	0.69
NMNEHC (VOCs) (mol. wt. of 15.84)	(8)(9)(10)	g/bhp-hr	0.42	0.42	0.44	0.47
HCHO (Formaldehyde)	(8)(9)	g/bhp-hr	0.22	0.22	0.22	0.23
CO2	(8)(9)	g/bhp-hr	507	507	515	539
EXHAUST OXYGEN	(8)(11)	% DRY	7.8	7.8	7.8	7.5

HEAT REJECTION						
HEAT REJ. TO JACKET WATER (JW)	(12)	Btu/min	42326	42326	35191	29246
HEAT REJ. TO ATMOSPHERE	(12)	Btu/min	5123	5123	4270	3480
HEAT REJ. TO LUBE OIL (OC)	(12)	Btu/min	6312	6312	5248	4362
HEAT REJ. TO AFTERCOOLER (AC)	(12)(13)	Btu/min	8645	8645	5469	1987

COOLING SYSTEM SIZING CRITERIA			
TOTAL JACKET WATER CIRCUIT (JW+OC)	(13)	Btu/min	54134
TOTAL AFTERCOOLER CIRCUIT (AC)	(13)(14)	Btu/min	9078

A cooling system safety factor of 0% has been added to the cooling system sizing criteria.

### CONDITIONS AND DEFINITIONS

Engine rating obtained and presented in accordance with ISO 3046/1, adjusted for fuel, site altitude and site inlet air temperature. 100% rating at maximum inlet air temperature is the maximum engine capability for the specified fuel at site altitude and maximum site inlet air temperature. Maximum rating is the maximum capability at the specified aftercooler inlet temperature for the specified fuel at site altitude and reduced inlet air temperature. Lowest load point is the lowest continuous duty operating load allowed. No overload permitted at rating shown.

For notes information consult page three.

Run 3 - intake man press -> 22.0 psi -> 44.79 in Hg

$$Patm = 24.72 \text{ in Hg}$$

$$Pabs = 69.51 \text{ in Hg}$$

Unit exceeds scale of heat balance table  
assume running at maximum rated load -> 1292 BHP

## **APPENDIX D**

### EPA Method 19 Calculations

Test Run	Fd Factor	BSFC	BHP	Avg O2 %	NOx PPM Corrected	CO PPM Corrected	NOx lbs/hr	CO lbs/hr	NOx g/BHP-hr	CO g/BHP-hr
1	8710	9400	1263.0	9.8	22.7	10.3	0.52	0.15	0.19	0.05
2	8710	9400	1263.7	9.8	21.2	10.4	0.49	0.15	0.18	0.05
3	8710	9400	1292.0	9.9	19.4	10.3	0.46	0.15	0.16	0.05
Average Levels			1272.9	9.8	21.1	10.3	0.49	0.15	0.18	0.05

## **APPENDIX E**

# FTIR Engine Test Sheet

Company Name	XTO
Location / Unit I.D.	LCC-#4
Type of Test Completed:	FTIR 31 hour NOx, CO, HC off
Field Technician (s)	Stephen Pyne
Client Rep and/or State Rep	Derrick - #0
Date:	3-4-15

	Test 1	Test 2	Test 3
Time of Readings	9:25am	10:35am	11:45am
Atm Pressure (in Hg)	24.63	24.63	24.64
Atm Temp (°F)	71°	79°	81°
Engine RPM	1350	1350	1350
*Manifold Pres. Vac(+) or Boost(psi)	21	21	22
Manifold Temp (°F)	126°	137°	137°
Psuction (psi) Stage 1	37	38	41
Tsuction (°F) Stage 1	58°	59°	60°
Pdischarge (psi) Stage 1	117	121	115
Psuction (psi) Stage 2	117	121	116
Tsuction (°F) Stage 2	71°	73°	74°
Pdischarge (psi) Stage 2	412	416	413
Psuction (psi) Stage 3			
Tsuction (°F) Stage 3			
Pdischarge (psi) Stage 3			
Psuction (psi) Stage 4			
Tsuction (°F) Stage 4			
Pdischarge (psi) Stage 4			
Gas Throughput (mmcf/d)			
Pre CO (ppm)			
Pre Cat Temp (°F)	804°	804°	807°
Post Cat Temp (°F)			
Cat Differential Pres. (" of H2O)	3.2"	3.2"	3.2"
Impinger 1 (grams)	/	/	/
Impinger 2 (grams)	/	/	/
Impinger 3 (grams)	/	/	/
Impinger 4 (grams)	/	/	/
Dry Gas Meter (cubic ft)	/	/	/
DGM Inlet Temp (deg F)	/	/	/
DGM Outlet Temp (deg F)	/	/	/
O2 %	9.8%	9.8%	9.9%
CO2 %	Dry 6.63%	6.6%	6.5%
LOAD %	95%	95%	95%
Delta H			
Ignition Timing (°F)	27.7°	27.7°	27.7°
AFR Setting mV (Left Bank)			
AFR Setting mV (Right Bank)			
Upstream Port Distance (pd)	48"		
Downstream Port Distance (pd)	48"		
Exhaust Diameter (inches)	12"	Cylinder Serial #↓	
Propane	499.1		
NO	504.1		
CO	499.9		
NO2	152.6		
Ethylene	162		
Methane	509.7		
Acetaldehyde	33		
Engine Make	CAT		
Engine Model	3516LE		
Engine S/N	4EK03003		

\* Some units show boost in inches of Hg. In this situation please indicate if it is positive (+) or negative (-). Eg: (+12") or (- 5")

Rev 5

5/25/201

## Worksheet: O2 Stratification

EPA REFERENCE METHOD 3A (Determination Of Stratification)			
Port	Point	Insertion Depth (inches)	Reading (%)
A	1	.3	9.9
A	2	.8	9.9
A	3	1.4	9.9
A	4	2.1	9.8
A	5	3	9.8
A	6	4.3	9.8
A	7	7.7	9.8
A	8	9	9.8
A	9	9.9	9.8
A	10	10.6	9.8
A	11	11.2	9.8
A	12	11.8	9.8
<b>Average</b>			<b>9.89/0</b>

Notes: To demonstrate non-stratified flow and utilize one sampling location  
O2 may not deviate by more than +/- 0.3%.

- XTO  
- LCC-4  
- 3-4-15  
- 12" stack